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COULOMB ELECTRIC GRAVITY AND A SIMPLE UNIFIED THEORY (SUT)

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ABSTRACT. SUT is an aether theory. The fundamental substance of the universe is the electric charge, positive and negative. The aether is the substance of space, a superposition of two uniform charge density $+\rho_a$ and $-\rho_a$. There is only a single universal force, the Coulomb electrical forces of attraction and repulsion. Gravitation is the result of a small excess of Coulomb attraction over repulsion. There is no neutron within the nucleus of atoms; nuclear electrons are introduced instead. Mass conservation is valid. SUT develops an electric mechanics with no need of a mass as an independent physical dimension. An electric mass defined as volume/charge of charged particles completely replaces the gravitational mass concept.

1. INTRODUCTION

[Version 2] The basic postulates of the Simple Unified Theory (SUT) are as follows:

(1) The electric charge - The material substance of the universe is the electric charge, positive and negative. The total amount of positive charge in the universe is a constant equal to the total amount of negative charge.

(2) The aether - The aether is the substance of space. It is a superposition of two uniform charge density $+\rho_a$ and $-\rho_a$. It fills all space except the volumes of discrete electric matter. An aether volume element is electrically neutral, but may be polarized giving an electric dipole.

(3) Matter - Atoms of matter are formed from the fundamental subatomic particles of the proton and the electron. The electron has an electron charge of $-e$ distributed uniformly within a sphere of constant volume V_e. The proton has an electron charge of $+e$ distributed uniformly within a sphere of constant volume V_p.

(4) Matter creation and uncreation - Subatomic particles in pairs of equal unlike charges, such as the proton and electron, are

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created from the aether charge; they may be uncreated returning to the aether.

(5) Force - There is only a single universal force. It is the Coulomb electrical forces of attraction and repulsion. The attraction of unlike charges exceeds that of repulsion between like charges by a small fixed amount.

(6) Energy - There is only one type of energy and its source is electrical. Energy takes only three forms: 1) light energy - electric waves in the aether 2) electrical potential energy of matter 3) the kinetic energy of matter. The total energy of the universe is conserved. Energy may transform from one form to the other. Matter creation and uncreation may involve transformation of energy.

(7) Universal gravitation - gravity is the result of the small excess of Coulomb attraction over repulsion. If the electric constant for Coulomb repulsion is $k = \dfrac{1}{4\pi\epsilon_0}$, then the electric constant of attraction is $k(1 + d)$ where $d = G/2ke^2$; G being the gravitational constant, e the electron charge.

2. THE AETHER

There is no *'empty'* space. Space is filled with and penetrated by the aether; there is space between the protons and electrons of atoms. Light is an electric-mechanical wave of electric dipoles in the aether medium transporting energy. There is no loss of energy as it travels; its energy may only be absorbed when the waves meet with matter.

Before any further discussion of the aether, it is necessary to first discuss the Michelson-Morley experiments (MMX) of 1881/1887 as the mainstream interpretation of the MMX is that it is a refutation of the existence of an aether as a medium of transmission of light waves. In all current literature and textbooks, it is mentioned that the the MMX produced a 'null' result. The MMX, through their then newly designed interferometer, was an experiment meant to detect the earth's relative motion in the aether. The Maxwell's theory shows light to travel with a universal constant speed c as a wave in the 'luminiferous' aether. If there is relative motion of the earth in the aether, the speed of light as measured by a stationary observer on earth should vary depending on the speed of the earth as it orbits around the sun changing directions with the seasons. The result of the MMX was unexpected. No motion of the earth in the aether was detected by the experiment - thus the 'null' result. ***Einstein took as implication that there was no aether; the speed of light was invariant to moving inertial observers - light speed is a universal constant!*** This is now incorporated as the second postulate of special

relativity. In the author's other paper [2], it is shown that the concept of speed in Newtonian mechanics is non-invariant by definition - any speed measured must vary with the motion of the observer; this is implied in the Galilean transformation. So, Einstein postulated a *'speed'* - that of light - to be invariant! This is a direct contradiction of a fundamental definition under Newtonian mechanics making special relativity independent of Newtonian mechanics - the two mechanics cannot be compared, the one with the other. From the paper:

> ***The result of the Michelson-Morley experiment shows either the experimental setup was a failure or the interpretation of the experiment was wrong.***

Many authors have shown why the MMX experiments have been misconceived and also misinterpreted. The interferometer correctly showed the null result - which it should be. The MMX experiment by design cannot detect any relative motion of the earth in the aether. By far the best paper is that by Cyrus Master-Khodabakhs [7] which gives a simple explanation why the MMX experiment would not be able to detect any relative motion of the earth in the aether. *It is beyond imagination that such simple refutations of the MMX never get into the mainstream physics literature after 130 years!*

The aether has gravitational mass density. For any infinitesimal element of volume of the aether, it may be considered to be the superposed of an element $+\rho_a dV$ and an element $-\rho_a dV$. If there are two volume elements of the aether, the elements have a mutual gravitational attraction between them due to the excess of the Coulomb attraction over the repulsion. This implies the aether has a matter mass density. The aether has a uniform gravitational mass density throughout the universe, but the gravitational field is zero everywhere. This is based on the assumption of an infinite universe.

3. THE ATOMIC MODEL

Atoms of matter are aggregates of electrons and protons which are created out of the aether. SUT has no neutron as a fundamental neutral particle within the nucleus. An element $_Z^M X$ represent the element X with Z orbital electrons, M nuclear protons and $M - Z$ nuclear electrons. Z is the atomic number and M the mass number of the specific isotope of the element. As will be shown later, the law of mass conservation is implied in SUT. The atomic mass of hydrogen ^1H is exact 1 u (unified atomic mass unit). All nuclides $^M X$ have atomic mass of of M u. Elements have the same atomic number.

Edwin Kaal [3] has come out with a Structured Atom Model (SAM) that seems successful in building the elements of the periodic table with only protons and electrons. They may have success in explaining the nuclear and chemical properties of the periodic table by building

the nucleus from four platonic solids - the tetrahedron, octahedron, dodecahedron and icosahedron. The protons occupy the vertices of the solids.

In SUT, there is no nuclear strong force of the Standard Model. The forces holding the nuclear protons together is still the Coulomb attractions of the properly spaced nuclear electrons within the atom's proton structure. If we examine the structure of a nuclear grouping of (p-e-p) with an electron e midpoint between two protons p, the p-e attraction is four times that of the p-p repulsion; this should enable such a (p-e-p) within the nucleus to be stable (this grouping is the nucleus of ^2H deuterium). The stability of a (p-e-p) may explain why stable atoms tend to have a nucleus with an equal number of protons and 'neutrons' - two protons for every nuclear electrons. The nuclear electrons need only be 'strategically' spaced among the protons to optimized the Coulomb attractions to bind the protons to a stable nucleus.

4. A SINGLE UNIFIED FORCE OF NATURE

It is not surprising that early physicists tried to find links between gravity and the Coulomb electrostatic forces as both are inverse-square forces. Faraday attempted experiments to relate gravity and electricity, but was unsuccessful. From his published essay [4]:

> "*The long and constant persuasion that all the forces of nature are mutually dependent, having one common origin, or rather being different manifestations of one fundamental power, has made me often think upon the possibility of establishing, by experiment, a connection between gravity and electricity, and so introducing the former into the group, the chain of which, including also magnetism, chemical force and heat, binds so many and such varied exhibitions of force together by common relations. Though the researches I have made with this object in view have produced only negative results, yet I think a short statement of the matter, as it has presented itself to my mind, and of the result of the experiments, which offering at first much to encourage, were only reduced to their true value by most careful searchings after sources of error, may be useful, both as a general statement of the problem, and as awakening the minds of others to its consideration.*"

> **There is only one single force in nature. It is the Coulomb's electric force obeying the inverse square law.**

Gravitation is simply the excess of the attractive forces between unlike charges over the repulsive forces between like charges. This had been proposed in 1830 by O.F. Mossotti, a French physics teacher at the University of Buenos Aires [5]. It was said Weber gave serious consideration to the Mossotti hypothesis[6]:

> *In a posthumously published manuscript on the relationship of electricity and gravitation, he discussed the extreme difficulty of experimentally determining whether such a small difference between attractive and repulsive forces exists.*

Neither Faraday's experiments nor Weber's could have found any connection between electricity and gravity as gravity is only 10^{-37} times that of the electrical forces. Even with today's advanced technology it may still be impossible to directly verify if gravitation comes from the Coulomb's force. The best verification of Coulomb's law is only to 1 part in 10^9 and this would not be able to detect any slight difference between Coulomb attraction and repulsion.

As it is near impossible to experimentally verify such a hypothesis, we could only depend on theoretical deductions and the predictions from such a theory. Such an electric gravitation theory would not be possible entering the 20th century with the introduction of mass-energy equivalence based on $E=mc^2$ and the introduction of the concept of neutrons within the nucleus of atoms. Only with the revival of mass conservation [1] and the repudiation of the neutron particle within the nucleus of atoms would this Coulomb gravitation be possible[1]. A simple counter example is gravity between two ^{1}H hydrogen atoms and that between two ^{2}H deuterium. With neutrons within deuterium, the forces of net excess Coulomb attractions in the two cases are the same, but the mass of deuterium is twice that of the ^{1}H hydrogen atom. But when we consider the neutron within the nucleus to be just an extra proton and an electron - introducing the concept of nuclear electrons - then the inverse square law of gravitation would be upheld. The ^{1}H hydrogen atom has the mass of 1 amu and that of deuterium 2 amu. The excess Coulomb attraction between neutral atoms would then exactly be proportional to mass (whole number of proton-electron pairs) and inversely proportional to the square of the distance separation. This is Newtonian gravitation based on the Coulomb's law of electrostatic.

> **Newtonian Gravitation is the result of the Coulomb's Law of electrostatic where attraction exceeds repulsion by a fixed small difference.**

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[1]the author has an earlier article which shows mass conservation is obeyed in atoms; the mass of any nuclide is its mass number in amu.

If we consider the electric constant in Coulomb's law of $k = \dfrac{1}{4\pi\epsilon_0}$ to be that for repulsion between like charges, then the electric constant for attraction between unlike charges would be $k(1 + d)$ where d is equal to 3.98839 x 10^{-37}. This is obtained by considering the attraction between two ^{1}H atoms; the gravitation attraction is : Gm^2/r^2 and the Coulomb attraction is : $2kde^2/r^2$; m being the mass of hydrogen (1 amu) and e the electron charge. Equating the two gives $d = Gm^2/2ke^2$ or 3.98839 x 10^{-37}.

There seems to be a paradox in this electric gravitation. The 'weight' of a proton is equal to the 'weight' of an electron! This is so as both will be attracted equally by the earths gravity. The proton and the electron will balance in a scale balance! But our current understanding is that the mass of the electron is only about 1/1836 of that of the proton's. Nonetheless, the scale balance will weigh neutral bodies correctly as they have integral numbers of proton-electron pairs. So the 'weight' of a neutral body is correct and represents its Newtonian mass. But the 'weight' of a free electric charge particle would not come correct to represent its mass. This paradox would be resolved with the new electric laws of motion as developed in a section below.

5. An Electric Mechanics And Laws Of Motion

In his time, the only significant force that Newton could include in his *'Principia'* was gravity; there were scant enough understanding then of electrostatic and magnetism for him to include such other forces that may occur in nature. Thus the force in his laws of motion was from his universal law of gravitation - the gravitational force alone. So it may be said Newtonian mechanics was a gravitational mechanics and the mass of material bodies were a related invariant gravitational mass.

In SUT, our attempt should be a new electric mechanics that adapts Newtonian mechanics to only a single electric force. As the only material of the universe is now the electric charge, the *'quantity of matter'* should also be due to the electric charge. We should be able to define a new concept of an electric mass, the emass, without the need to introduce an independent physical dimension for it. So the basic physical dimensions of nature within which a physical theory should be developed should be space [L], time [T] and the electric charge [C].

We will examine what actual form the electric mass should take by examining the actual motion of the electron and proton under the electric force. The current empirical evidence is that, under the action of the same electric force, the electron accelerates faster than the proton by a factor of about 1836. SUT has now introduced two more universal constants of nature, the charge volume V_e and V_p of the

electron and proton; their values are to be determined experimentally.If emass is taken to be magnitude of volume/charge, then the emass of the electron and proton would be $m_e = V_e/e$ and $m_p = V_p/e$. Such a definition of emass would obey the law $F = ma$ and the empirical evidence of the accelerations of the electron and proton provided $m_p : m_e$ is 1836:1. This assumption implies $V_p/V_e = 1836$, but this has not been experimentally verified. The implication is that such a definition of emass may be introduced into SUT, but the verification of SUT as a theory would have to await the experimental verification of the constants V_e and V_p.

We may term volume/charge, the inverse of a charge density, to be 'charge sparsity'. We should now define the emass to be the magnitude of charge sparsity. With such a definition, Newton's second law of $F = ma$ would apply where the force is the electric force and the mass to be the new emass. As atoms are now integral numbers of proton-electron pairs, the second law would also apply to an atom whose emass is simply the sum of the emasses of its electrons and protons. The emass of a neutral body would then be the sum of the emasses of all its atoms. The second law would be applicable to any electrically neutral body - the forces on such a body would still be electrical, but the weak 'gravitational' excess of attraction over repulsion.

The Electric Mechanics now consists of a concept of electric mass and the electric adaptation of Newton's three laws of motion:

- Axiom of Mass - The electric mass, or emass, of a volume of charge is the magnitude of volume/charge. For a discrete charged particle, it is the magnitude of its charge sparsity. Emass is additive within atoms and a body composed of atoms.
- First Law - A body electric will remain at rest or be in a uniform translational motion in the aether unless an impressed force acts on it.
- Second Law - The rate of change in momentum of a body electric is proportional to the impressed force.
- Third Law - A force of action elicits an equal and opposite force of reaction.

'quantity of matter' is now an electric mass, emass.Any discrete charge, such as the electron or proton, has an invariant emass. The aether too may be said to have an electric mass property. For any element dV of aether, its emass is a constant $2/\rho_a$ where ρ_a is the uniform charge density of the aether. Emass has dimension of $[L]^3[C]^{-1}$. Newton's three laws of motion is almost unchanged. The only difference is that force is the Coulomb electric force. Momentum and the second law takes the electric emass.

The dimension of emass now depends on $[L]^3$ and this has a physical significance. We know that solids and liquids of a pure chemical

substance have a fixed density under some usual pressure and temperature. So gravitational mass is proportional to volume. As gravity is now electrical, the attraction of the earth on a body is proportional to the number of proton-electron pairs in the body. In other words, gravitational mass too is proportional to the emass of the body. This means the definition of emass to be proportional to charge volume has support in physical nature.

5.1. **SUT Units And Dimensions.** The SUT dimensions of the various physical quantities are:

- emass - $[L]^3[C]^{-1}$.
- momentum - $[L]^4[C]^{-1}[T]^{-1}$.
- force - $[L]^4[C]^{-1}[T]^{-2}$.
- energy - $[L]^5[C]^{-1}[T]^{-2}$.

We now consider how best to define a standard unit of emass. In the earlier version of this paper, the value of 1 $m^3.C^{-1}$ was suggested. But such a value may be meaningless as there may not be any body that could have such an emass. A possibility is to make use of our current standard kilogram. Any object with a mass of 1 kg has the same integral multiple of the emass of the ^{1}H atom. The number of atoms in 1 kg of ^{1}H is 1000 N_a where N_a is the Avogadro constant of about 2.066×10^{23}. We may define the electric kilogram to be the emass of 1000 N_a atoms of ^{1}H. The current Avogadro constant of N_a need to be experimentally determined as it is dependent on the mass of the kilogram artifact. If we now define N_a to have an exact value, our electric kilogram would be an exact value, a constant integral multiple of the emass of the ^{1}H atom. We take as the exact value of N_a to be the best accepted value of $6.02214076 \times 10^{23}$ mol^{-1}:

> **The Avogadro constant is defined to be 6.02214076 $\times 10^{23}$ mol^{-1}.**

The standard of the electric mass, the electric kilogram may thus be defined:

> **The ekilogram, symbol ekg, is the emass of 6.02214076 $\times 10^{26}$ atoms of ^{1}H.**

In everyday use, the electric kilogram is the same as our gravitational kilogram as 1 ekg and 1 kg will balance on a weighing scale.

The following definitions are taken as standard SUT units:

- The standard of force is the eNewton, symbol eN, that imparts an acceleration of 1 m/s^2 to an emass of 1 ekilogram.
- The unit of energy is the eJoule, symbol eJ, equal to the work done by a force of 1 eNewton on an emass of 1 ekilogram through a distance of 1 meter.
- The electric atomic mass unit, symbol eu, is the emass of the hydrogen atom ^{1}H.

Most aspects of electric mechanics, when treated in the 'gravitational' aspect, would be identical to Newtonian mechanics. The ekilogram is equal to the kilogram,the eNewton equal to the newton and the eJoule equal to the Joule.

The ekilogram is defined with respect to the electric atomic mass unit which has a constant charge volume and the electron charge. Given an amount of m ekg, we know the amount of electric charge in m, but we cannot yet know the actual charge volume of m. The amount of charge volume may be known only after an experimental determination of the two new universal constants of V_e and V_p.

5.2. **Free fall Of Electrons and Protons under Earth's Gravity.** As subatomic particles too have mass, the current understanding is that they too would be attracted by gravity and that their free fall in vacuum under the earth's gravity would be no different to that of a neutral matter body. But this is only a theoretical prediction that has never been experimentally verified. It may be near impossible to perform any free fall experiment of an electron in vacuum as even slight electrostatic charges around would nullify the experiment.

SUT predicts the free fall to be different from the current assumption. The forces of the earth's attraction on the electron and the proton are the same, but the emass of the electron is only 1/1836 that of the proton. So the electron will hit the ground way ahead of the proton. This is understandable if gravitation is truly the result of a residual Coulomb attraction over repulsion; free fall of electrons and protons under the earth's gravity is wholly electrical. The particles are just moving through a residual electric field, albeit very weak as compared to any usual electric field. The acceleration would be much greater for the electron.

6. Conclusion

An aether based Simple Unified Theory (SUT) has been developed where the only substance of the universe is the electric charge, positive and negative. The three fundamental physical dimensions of nature are space, time and the electric charge; the need of the dimension of mass is eliminated. Newton's laws of motion has been adapted for an electric mass defined as volume/charge. Gravitation has been subsumed under the Coulomb's law.

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